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ABSTRACT

Many educational institutions have moved toward situated learning and problem-based learning (PBL) in which students, to learn, must rely on investigations of problems within an authentic professional context. A study examined and described how students read and learn in such a context. Results of a 1995 qualitative study showed that four out of six medical students were not using efficient strategies to read and learn in this context; to explore these findings in more depth another study was conducted in 1997. Research objectives were to describe the different strategies--encoding/retrieval, reading, metacognitive, and resources managing--used by medical students as they learn in a PBL program; and to explore the relationship between the strategies used and knowledge acquired. Subjects, third-year medical students, must first use their prior knowledge to analyze the problem; then they must read texts on the subject to complete their knowledge; and finally they must organize all the information into a conceptual map. Those three tasks combine to create a context that sustains purposeful learning. Research protocol is descriptive and data were collected from the two aforementioned studies. For the group as a whole, half the strategies used were of metacognitive nature, and encoding/retrieval and reading strategies were equally used (24% and 26%). In reading, more strategies for reading text were used than working on ideas. In encoding/retrieval, strategies used were repetition, selection, elaboration, organization, and notetaking in descending order of frequency. For metacognitive strategies, evaluation was found twice as often as planning and monitoring. As for resource managing strategies, students used a reference book for a third of the time. (NKA)

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by

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Learning by Reading: Description of Learning Strategies of Students Involved in a Problem-Based Learning Program

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Introduction and Objectives

Many educational institutions, including many medical schools, have moved toward situated learning and problem-based (PBL) in which students must rely on investigations of problems within an authentic professional context in order to learn. In those situations, students experience less lecture-based learning and more of their learning relies on individual reading. The present research seeks to understand and describe how students read and learn in such a context.

In a problem-based learning curriculum in a Quebec medical school, students spend at least 80% of their time on reading activities. Results of a qualitative study conducted in 1995, show that four out of six students were not using efficient strategies to read and learn in this context. Those four students were the ones who had acquired less knowledge and it was less organized compared to the two students using better strategies. Medical teachers were surprised by the fact that many students were not using efficient strategies. In order to explore these findings in more depth, another study was conducted in 1997. This paper presents data and analysis from both studies. Two general questions were addressed : What do medical students do when they read texts to acquire knowledge related to medical profession? And does the way they read influence their knowledge acquisition? This kind of information is new in the PBL literature for both medicine and other professions, as PBL literature has been more concerned with problem analysis.

The objectives of this research are to describe the different strategies – encoding/retrieval, reading, metacognitive and resources managing - used by medical students as they learn in a PBL program; and to explore the relationship between the strategies used and knowledge acquired.

Theoretical Framework

Very little literature relates to the study of learning by reading in higher education (Smith, 1982; Wade Trathen and Schraw, 1990; Entwisle and Entwisle, 1991, Lahtinen, Lonka and Lindlom Ylänne, 1997).

To understand and describe the way students read and learn in a professional program, we used a specific theoretical framework of learning by reading developed in this context. This framework integrates components of models of reading comprehension and learning from texts. This integrative framework describes the way students understand what they read and how they learn it. The framework of learning by reading involves nine components. Six relate to the reader (reading strategies, encoding / retrieval strategies, metacognitive strategies, resources managing strategies, conception of learning and prior knowledge), two to the text (superstructure and organizational aspects of the text) and one to the context (activities of learning).

Methodology

This research was carried out with third year medical students. Students must first use their prior knowledge to analyze the problem. Secondly, they must read texts on the subject to complete their knowledge. Finally, they must organize all the information into a conceptual map. Those three tasks combine to create a context that sustains purposeful learning.

The research protocol is descriptive and data were collected from two separate studies: 1995 and 1997. Twenty-two third year medical students participated: six in 1995 and 16 in 1997. All were studying the problem that was related to alcohol consumption. In 1995, the 6 students had studied the problem in mid-October and in 1997, 7 of them studied the problem in October and 9 in November. Technical recording problems were encountered with two subjects, reducing the total of 20 for the study of the relationship between the strategies used and knowledge acquired. All subjects were selected by the researcher on the basis of the following criteria: their mother tongue had to be French, they also had to have the same academic background before their admission to the university and during their medical studies.

Data Source and Analysis

The data collected were qualitative in nature. To describe the students' learning strategies, data were collected from two different sources to permit triangulation (Savoie-Zajc, 1993). The students were asked to keep a journal in which they were to write what they did while reading about the problem over a seven-day period of work on the problem. The principal researcher and the assistants met with all students individually at the beginning of the experimentation week and gave them instructions as to what to write in their journals. The students were also given a summary of the information to collect. Students were asked to provide a copy of all annotated material read and notes taken. Second, information was collected from semi-structured interviews done with students following their reading period. In the first part, students were asked to describe the way they worked through their individual reading period. In the second part, students were invited to talk about more general questions like: "Is this week representative of the way you usually work?" etc.

To answer the second objective of exploring relationships between strategies and knowledge acquisition, two interviews were conducted, one before and one after the reading period to evaluate knowledge acquisition. Before the reading period, students were asked: « What do you know about the problem of…?" Four specific questions were asked to help them elaboration on their knowledge. For example, "What do you know about chronic problems related to…?" After the reading period, students were asked: "What have you learned on the problem at hand by reading during this past week (since your first evaluation) ? » The four questions from the first interview were repeated.

The journals were coded according to a list of strategies. The list content was based upon the models of Weinstein and Mayer (1986), Pressley and Afflerbach (1995), and Cartier (1997). Content analysis was done by frequency analysis to obtain a general portrait of the strategies used during the entire reading period. The NUD*IST software program was used to code and to conduct the frequency analysis. Data were analyzed in terms of a general portrait of strategies used by the group as a whole.

As for the second objective, strategies used by each student were related to the knowledge acquired during the week. Three medical teachers participated to the evaluation of knowledge acquired; one of the teachers participated in both the 1995 and 1997 studies. Two teachers evaluated each subject. Based on a qualitative analysis, the inter-rater reliability of the teachers showed strong agreement for each student. To evaluate students' knowledge acquisition, both teachers assessed the quantity and relevance of knowledge acquired using a grid developed by one of them and validated by the others. The presence and the relevance of specific information related to the problem determined the quantity of knowledge. The relevance of the information was assessed by three criteria : usefulness for clinical reasoning, outcome for patients' survival and frequency in clinical practice. Quality of the knowledge organization as reported by students was also reported as clinically relevant, organized according to an organ-system-based structure or without organization. Finally, students were classified into four categories based on the quantity and quality of knowledge acquired : high, average-high, average and weak. A portrait of strategies frequently used by each subgroup of performance was identified relating strategies and knowledge.

Results and Interpretation

For the group as a whole, half the strategies used during the week were of metacognitive nature (50%), and encoding/retrieval and reading strategies were equally used (24 % and 26%). In reading, more strategies for reading the text (reading a section) are reported to be used than working on ideas (identifying key words). In encoding/retrieval, strategies used were repetition, selection, elaboration, organization and note taken in descending order of frequency. For metacognitive strategies, evaluation found twice as often as planning and monitoring. As for resources managing strategies, students used a reference book for a third of the time.

As a general portrait of the strategies used, we found that most of the students do not use many encoding/retrieval and reading strategies and the most frequently used are not the most useful to integrate knowledge. Students were supposed to study using their prior knowledge (elaboration); they also had to integrate in a concept map the knowledge related to the problem (organization).

This general portrait looks more like the one they used in their first years of studying when they had to select information and repeat it in order to remember it for the exams. We can explain the amount of metacognitive strategies used by the fact that students, at this step in the program, are exposed to a new way of working and they are looking for an efficient way to do it.

As for the relationship between strategies and knowledge acquisition, both in quantity and quality, we previously described four categories of subjects : high performance (4 students), average-high (6 students), average (4 students) and weak (6 students). High performance subjects differ from all the other subjects because they used more reading strategies. Subjects in both the high and average-high performance categories distinguish themselves from the other subjects by the links they make while reading, with their prior knowledge. This observation can be related to the necessity to elaborate and organize knowledge in order to learn. All students are required to produce a schema at the end of the week and the best students differ from the other students by the way they elaborate on their reading. More than the strategy of paraphrasing, the links to the background knowledge seem to be the strategy that has made the difference.

Educational Importance of the Study

The findings of this research are important. They relate to findings by Lahtinen et al. (1997) who said that spontaneous study strategies used while learning from text seem related to the cognitive processes of knowledge construction and that the way knowledge is constructed will have an impact on the knowledge acquisition.

This study gives an idea of what students should do to learn while reading in the context of analyzing a complex problem. As shown before (Cartier, 1997), the best student is one that uses as many encoding/retrieval, reading and metacognitive strategies. Efficient strategies should be linked to two learning processes: elaboration and organization. Also, importance should be placed on the way students use their metacognitive strategies such as their ability to successfully monitor their way of working

The tendency in Universities to focus more on professional training leads us to think that analyzing complex problems will become an important activity involving learning by reading. This study offers a basis to understand what students need to do. In Problem-based learning programs, teachers must realize that many students do not know how to work in this context and that specific training should be offered to help them integrate information and not just select and repeat them.

Results of this study are also important because they may be useful in understanding other learning situations such as: autonomous learning, lifelong learning, distance learning ,and continuous learning. In all those situations, people may have to learn to answer complex questions using individual reading.

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